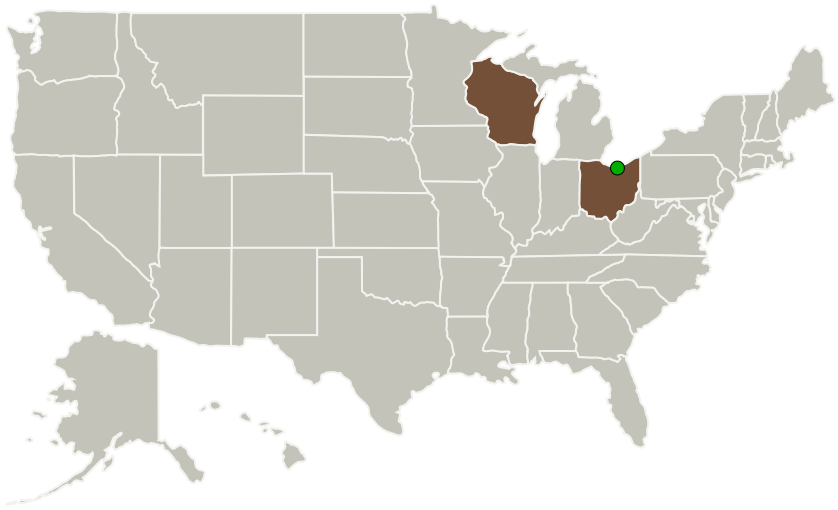
Non-Toxic Ionic Liquid Fuels for Exploration Applications, Phase I

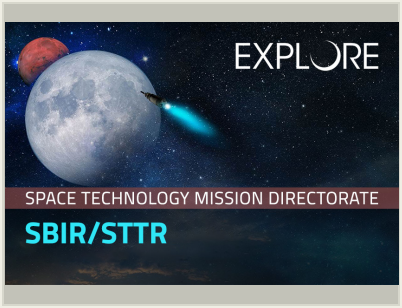
Completed Technology Project (2010 - 2010)

Project Introduction

Challenges arise in the propulsion systems for the new exploration architecture. The currently operational and proven storable hypergolic systems raise toxicity concerns. Because MMH is a carcinogen, measures must be taken to prevent exposure of personnel to the fuel from the time of its synthesis to the time of it neutralization. This extra care translates into increased expense for the mission. Replacing the MMH in the propulsion systems with an equally energetic, sasfer fuel would considerably reduce risk and cost on exploration missions. Ionic liquids offer promising candidates for dense, energetic, and safe rocket fuels. In the proposed work ORBITEC will demonstrate the feasibility of developing hypergolic ionic liquid fuels for propulsion systems used in the Exploration architecture. We will develop one set hypergolic with a storable oxidizer, nitrogen tetroxide (NTO) and one set hypergolic with a cryogenic oxidizer, liquid oxygen (LOX). We will test the hypergolicity and the material properties. The resulting sets of propellants will be ready for performance testing early in the Phase II work to enable achieving a technical readiness level (TRL) of 5 by the end of the Phase II work.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Sierra Nevada Corporation(SNC)	Lead Organization	Industry Women-Owned Small Business (WOSB)	Sparks, Nevada
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio
Orbital Technologies Corporation	Supporting Organization	Industry Women-Owned Small Business (WOSB)	Madison, Wisconsin

Primary U.S. Work Locations	
Ohio	Wisconsin

Project Transitions

January 2010: Project Start

July 2010: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140069)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Sierra Nevada Corporation (SNC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Millicent R Coil

Co-Investigator:

Millicent Coil

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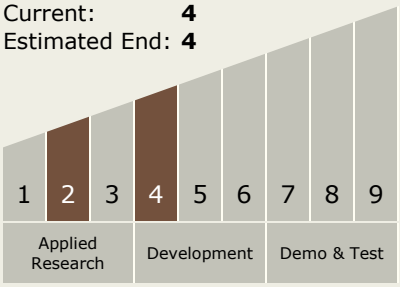
Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.1 Chemical Space Propulsion
    - TX01.1.2 Earth Storable

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System